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Invertebrate survey and classification
of rivers for nature conservation

1989/90 report

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1. Introduction

In 1986 the Freshwater Biological Association (now the Institute of Freshwater Ecology) was contracted by the Nature Conservancy Council to undertake an examination of the macroinvertebrate fauna of a series of river systems in Great Britain. The project was entitled 'Invertebrate Survey and Classification of Rivers for Nature Conservation' and was funded for a period of three years (contract number HF3-03-340). Some years previously the NCC funded a national survey of river vegetation (Holmes 1983). The purpose of sponsoring work on the macroinvertebrate fauna of selected rivers was to fill in some of the gaps in the biological data-base. Only by the acquisition of high quality data on both river vegetation and the macroinvertebrate fauna over a wide range of rivers can an informed procedure be developed for the selection of rivers for notification as SSSI's.

In 1986 seven river systems in Scotland (20 sites) were sampled for macroinvertebrates (Wright *et al.* 1987) whilst in 1987, sampling was confined to five river systems (21 sites) in England and Wales (Wright *et al.* 1988).

Prior to the 1988 sampling operation, the NCC took a policy decision to put additional resources into the conservation of rivers. As part of this policy, new funds were made available to undertake further survey work to enlarge the biological data-base. Under a new research project entitled 'Survey of Rivers for Conservation' a coordinated programme of river corridor, macrophyte and macroinvertebrate survey was developed. The IFE were asked to undertake the macroinvertebrate survey element of the work, using the existing methodology and new funding was provided for the period April 1988 to February 1992 (contract number HF3-08-33).

As a consequence, the funding for 1988/89 was higher than in the two previous years because it included funds from the final year of the initial contract plus funds from the new contract. In 1988, nine river systems (28 sites) in England and Wales were examined (Wright *et al.* 1989). Evaluation of the data (i.e. site classification and assessment of the conservation value of each site) has been postponed until the final year of the contract (1991/92).

2. Programme of work

The four elements of the programme are as follows:

1. A sampling programme for invertebrates in each year of the project on a series of rivers selected by the NCC. The field sampling techniques are compatible with the IFE 'River Communities Project' but also take into account the further requirements of the NCC (see methods section).
2. Identification of the fauna, transfer of the data to computer and reporting of results in the form of species lists at the end of each year.
3. In the final year, the invertebrate species lists will be used to classify each site, using the latest IFE classification system.
4. The conservation value of the sites on all rivers sampled will also be assessed in the final year, using criteria provided by the NCC. These criteria include presence of rare species and/or rare communities, species richness at the site and the occurrence of representative communities. These attributes will be assessed by reference to information on the distribution of species and communities throughout Britain, which is available within the 'River Communities Project'.

3. Study sites

This year the emphasis has been on the acquisition of macroinvertebrate data for a number of streams and rivers in northern England and Scotland which are designated as NCR sites (Ratcliffe 1977).

They are

	NCR Code
Malham-Arncliffe streams	OW 47
Knock Ore Gill	OW 55
R. Laxford	OW 97
R. Hull/Kelk Beck	OW 120
R. Brora/Blackwater	OW 129

In the Malham-Arncliffe area, Cowside Beck (2 sites) and Gordale Beck (2 sites), within the catchment of the Yorkshire Ouse, were sampled. A single site was chosen within the Moor House NNR in the Pennines on Knock Ore Gill which flows westwards to join the Millburn

Beck and thence the R. Eden. Similarly, one site was sampled on the R. Laxford in Sutherland downstream of Loch Stack. The upper reaches of a northern chalk stream, the R. Hull (3 sites), together with its tributary the Kelk Beck (2 sites), were also examined. Finally, an east flowing river system in Sutherland, the R. Brora (3 sites) and its major tributary the R. Blackwater (2 sites) completed the total of 16 sites which were examined in spring, summer and autumn of 1989. A full list of the site names, sampling method, national grid references and sampling dates are given in Table 1.

4. Methods

Two types of sample were required at each site in spring, summer and autumn. They were designated the 'main' sample and the 'supplementary' sample.

The field sampling technique used for the main sample ensured compatibility with the data-base held by the IFE within the 'River Communities Project'. At each site a 3-minute pond-net sample was taken which encompassed all available habitats in order to capture the widest range of invertebrates within the allotted time. Each sample was preserved in the field before being transported to the River Laboratory for sorting, followed by identification of the fauna. The details of both field sampling practice and the laboratory techniques may be found in Furse *et al.* (1986) which describes our standard methodologies. The requirements of this contract departed from the standard methods in one important respect. The Oligochaeta (true worms) and Chironomidae (non-biting midges), which are normally identified as far as current taxonomic keys allow (species/genus) were not identified. Nevertheless, the specimens have been retained and could be identified in the future if required.

Supplementary samples were taken in an attempt to increase the species lists further by examining additional habitats. Typically, the river bank was walked, both upstream and downstream of the main sampling location, in order to locate unsampled habitats. Supplementary samples taken by kicking or sweeping with a pond-net were untimed, but up to 30 minutes was spent picking out invertebrates in the field before the specimens were preserved for later identification in the laboratory.

Table 1. Rivers and sites sampled in 1989. 'M' refers to the main sample and 'S' to the supplementary sample. See methods section of text for further details.

River	Site name	M/S	Method	NGR	Sampling dates		
					Spr	Sum	Aut
Cowside Beck	Nab End	M	Pond-net	SD 903700	12 Apr	18 Jul	3 Oct
	Nab End	S	Pond-net	SD 900701	12 Apr	18 Jul	3 Oct
	Arncliffe	M	Pond-net	SD 930719	12 Apr	19 Jul	3 Oct
	Arncliffe	S	Pond-net	SD 929718	12 Apr	19 Jul	3 Oct
Gordale Beck	Seaty Hill	M	Pond-net	SD 912654	12 Apr	18 Jul	3 Oct
	Seaty Hill	S	Pond-net	SD 912653	12 Apr	18 Jul	3 Oct
	Gordale Bridge	M	Pond-net	SD 914636	11 Apr	18 Jul	3 Oct
	Gordale Bridge	S	Pond-net	SD 912633	11 Apr	18 Jul	3 Oct
Brora	Dalnessie	M	Pond-net	NC 631155	16 Apr	8 Jul	14 Oct
	Dalnessie	S	Pond-net	NC 628157	16 Apr	8 Jul	14 Oct
	U/S Balnacoll	M	Pond-net	NC 789106	15 Apr	9 Jul	14 Oct
	U/S Balnacoll	S	Pond-net	NC 790105	15 Apr	9 Jul	14 Oct
	D/S Loch Brora	M	Pond-net	NC 870046	14 Apr	8 Jul	16 Oct
	D/S Loch Brora	S	Pond-net	NC 871045	14 Apr	8 Jul	16 Oct
Blackwater	Creag Dhubh	M	Pond-net	NC 684202	15 Apr	9 Jul	15 Oct
	Creag Dhubh	S	Pond-net	NC 686200	15 Apr	9 Jul	15 Oct
	Pollie	M	Pond-net	NC 747160	15 Apr	9 Jul	15 Oct
	Pollie	S	Pond-net	NC 748161	15 Apr	9 Jul	15 Oct
Laxford	D/S Loch Stack	M	Pond-net	NC 259447	17 Apr	11 Jul	16 Oct
	D/S Loch Stack	S	Pond-net	NC 257447	17 Apr	11 Jul	16 Oct
Hull	Little Drifffield	M	Pond-net	TA 010576	22 Apr	28 Jul	10 Oct
	Little Drifffield	S	Pond-net	TA 012575	22 Apr	28 Jul	10 Oct
	Wansford	M	Pond-net	TA 064559	21 Apr	28 Jul	11 Oct
	Wansford	S	Pond-net	TA 062561	21 Apr	28 Jul	11 Oct
	Corpslanding	M	Dredge	TA 066529	21 Apr	28 Jul	10 Oct
	Corpslanding	S	Pond-net	TA 064529	21 Apr	28 Jul	10 Oct
Kelk Beck	Harpham	M	Pond-net	TA 084614	22 Apr	28 Jul	11 Oct
	Harpham	S	Pond-net	TA 084615	22 Apr	28 Jul	11 Oct
	Foston	M	Dredge	TA 092551	22 Apr	27 Jul	11 Oct
	Foston	S	Pond-net	TA 093545	22 Apr	27 Jul	11 Oct
Knock Ore Gill	Green Castle	M	Pond-net	NY 711306	13 Apr	20 Jul	18 Oct
	Green Castle	S	Pond-net	NY 714308	13 Apr	20 Jul	18 Oct

At both main and supplementary sampling locations 'Sample Area' forms were completed on each occasion. The forms include information on site location and sampling method, stream dimensions, surface velocity and substratum type, together with a space for a sketch map and information on macrophytes etc. At main sampling sites in summer only a 'Survey Area' form was also completed. This was used for recording features whose values are less prone to seasonal variation and for collating further background data on each site. Examples of these forms and notes for their completion can be found in Furse *et al.* (1986).

On completion of all sample sorting and species identifications, the species lists were transferred to computer and validated. In the results section the printouts are given in two separate formats. The first gives details of the sampling procedures used at each site to obtain the main and the supplementary samples, followed by a single listing of all the species recorded at each site. The second printout is the species by sites matrix and this presents the invertebrate fauna recorded at each site in each season (spring, summer, autumn) for each river in turn. On this printout, species recorded in the main sample (+) are distinguished from additional species recorded in the supplementary sample (S) within any one season.

The report also includes a brief statement on some notable features of the fauna of each river. This information may be found in section 5.3.

Finally, the information on the invertebrate fauna recorded at each site has been used to calculate an index of river quality which is now widely used within the water industry. The Biological Monitoring Working Party (BMWP) score system was first used in a major survey of river quality in England and Wales in 1980 (National Water Council 1981). Scores are allocated to 'families' of invertebrates (range 1-10) according to their known tolerance to organic pollution. Addition of the scores for all scoring families at a site gives the total BMWP Score. The Average Score Per Taxon (ASPT), that is, total score divided by the number of scoring taxa, is also used in the appraisal of river quality. BMWP scores, number of scoring taxa, and ASPT values are provided for each extended sampling site (i.e. main and supplementary samples pooled) in each season and also for the three seasons combined.

5. Results

5.1 Species lists for each site

In the pages which follow, a species list is provided for each of the 16 sampling sites. The listings incorporate all species found in spring, summer and autumn 1989 in both the main and supplementary samples. Details of the procedures used for collecting the main and supplementary samples, the dates of collection and grid references are given at the head of each printout.

For more detailed information on the species recorded in particular seasons and additional species confined to the supplementary samples, see section 5.2.

	Pages
Cowside Beck	8
Gordale Beck	10
Brora/Blackwater	12
Laxford	17
Hull/Kelk Beck	18
Knock Ore Gill	23

SD 903 700	12 Apr	Main sample	3 minute kick/sweep
SD 900 701	12 Apr	Supplementary	Kick/sweep
SD 903 700	18 Jul	Main sample	3 minute kick/sweep
SD 900 701	18 Jul	Supplementary	Kick/sweep
SD 903 700	03 Oct	Main sample	3 minute kick/sweep
SD 900 701	03 Oct	Supplementary	Kick/sweep

Polycelis felina (Dalyell)
Crenobia alpina (Dana)
Lymnaea palustris (Muller)
Lymnaea peregra (Muller)
Pisidium casertanum (Poli)
Oligochaeta
Hydracarina
Gammarus pulex (L.)
Ameletus inopinatus Eaton
Baetis scambus group
Baetis rhodani (Pictet)
Baetis muticus (L.)
Centroptilum pennulatum Eaton
Proclonia bifidum Bengtsson
Rhithrogena semicolorata group
Heptagenia lateralis (Curtis)
Ecdyonurus sp.
Paraleptophlebia submarginata (Stephens)
Habrophlebia fusca (Curtis)
Ephemerella ignita (Poda)
Caenis rivulorum Eaton
Protonemura praecox (Morton)
Protonemura meyeri (Pictet)
Amphinemura sulcicollis (Stephens)
Nemoura cambrica group
Leuctra geniculata (Stephens)
Leuctra inermis Kempny
Leuctra hippopus (Kempny)
Leuctra nigra (Olivier)
Leuctra fusca (L.)
Perlodes microcephala (Pictet)
Isoperla grammatica (Poda)
Dinocras cephalotes (Curtis)
Chloroperla torrentium (Pictet)
Oreodytes sanmarkii (Sahlberg)
Hydraena gracilis Germar
Helophorus brevipalpis Bedel
Elmis aenea (Muller)
Esolus parallelepipedus (Muller)
Limnius volckmari (Panzer)
Riolus subviolaceus (Muller)
Rhyacophila dorsalis (Curtis)
Rhyacophila oblitterata McLachlan
Rhyacophila munda McLachlan
Plectrocnemia conspersa (Curtis)
Polycentropus flavomaculatus (Pictet)
Hydropsyche instabilis (Curtis)
Hydropsyche siltalai Dohler
Hydroptila sp.
Limnephilidae
Drusus annulatus Stephens
Ecclisopteryx guttulata (Pictet)
Melampophylax mucoreus (Hagen)

Tipula montium group
Dicranota sp.
Limnophila (*Eloeophila*) sp.
Hexatoma sp.
Pericoma sp.
Pericoma diversa Tonnoir
Pericoma neglecta Eaton
Ceratopogonidae
Chironomidae
Simulium (*Nevermannia*) *cryophilum* group
Simulium (*Simulium*) *argyreatum* group
Simulium (*Simulium*) *variegatum* Meigen
Wiedemannia group
Limnophora sp.

SD 930 719	12 Apr	Main sample	3 minute kick/sweep
SD 929 718	12 Apr	Supplementary	Kick/sweep
SD 930 719	19 Jul	Main sample	3 minute kick/sweep
SD 929 718	19 Jul	Supplementary	Kick/sweep
SD 930 719	03 Oct	Main sample	3 minute kick/sweep
SD 929 718	03 Oct	Supplementary	Kick/sweep

Crenobia alpina (Dana)
Lymnaea peregra (Muller)
Ancylus fluviatilis Muller
Succinea sp.
Zonitoides nitidus (Muller)
Oligochaeta
Hydracarina
Baetis scambus group
Baetis rhodani (Pictet)
Baetis muticus (L.)
Centroptilum pennulatum Eaton
Rhithrogena semicolorata group
Heptagenia sulphurea (Muller)
Heptagenia lateralis (Curtis)
Ecdyonurus sp.
Paraleptophlebia submarginata (Stephens)
Ephemerella ignita (Poda)
Caenis rivulorum Eaton
Protonemura meyeri (Pictet)
Amphinemura sulcicollis (Stephens)
Nemoura avicularis Morton
Leuctra inermis Kempny
Leuctra hippopus (Kempny)
Leuctra fusca (L.)
Isoperla grammica (Poda)
Dinocras cephalotes (Curtis)
Perla bipunctata Pictet
Chloroperla torrentium (Pictet)
Chloroperla tripunctata (Scopoli)
Brychius elevatus (Panzer)
Oreodytes sanmarkii (Sahlberg)
Platambus maculatus (L.)
Hydraena gracilis Germar
Helophorus arvernensis Mulsant
Elmis aenea (Muller)
Esolus parallelepipedus (Muller)
Limnius volckmari (Panzer)
Oulimnius tuberculatus (Muller)
Riolus cupreus (Muller)
Riolus subviolaceus (Muller)
Rhyacophila dorsalis (Curtis)
Glossosoma sp.
Agapetus sp.
Polycentropus flavomaculatus (Pictet)
Tinodes dives (Pictet)
Metalype fragilis (Pictet)
Psychomyia pusilla (Fabricius)
Hydropsyche sp.
Hydropsyche pellucidula (Curtis)
Hydropsyche siltalai Dohler
Hydroptila sp.
Ithytrichia sp.

Limnephilidae
Drusus annulatus Stephens
Ecclisopteryx guttulata (Pictet)
Potamophylax group
Potamophylax latipennis (Curtis)
Allogamus auricollis (Pictet)
Lepidostoma hirtum (Fabricius)
Sericostoma personatum (Spence)
Tipula montium group
Antocha vitripennis Meigen
Dicranota sp.
Hexatoma sp.
Pericoma sp.
Pericoma exquisita Eaton
Pericoma neglecta Eaton
Ceratopogonidae
Chironomidae
Simulium (Nevermannia) *cryophilum* group
Simulium (Eusimulium) *aureum* group
Simulium (Simulium) *reptans* group
Simulium (Simulium) *argyreatum* group
Simulium (Simulium) *variegatum* Meigen
Simulium (Simulium) *ornatum* group
Empididae
Chelifera group
Wiedemannia group
Atherix ibis (Fabricius)
Limnophora sp.

SD 912 654	12 Apr	Main sample	3 minute kick/sweep
SD 912 653	12 Apr	Supplementary	Kick/sweep
SD 912 654	18 Jul	Main sample	3 minute kick/sweep
SD 912 653	18 Jul	Supplementary	Kick/sweep
SD 912 654	03 Oct	Main sample	3 minute kick/sweep
SD 912 653	03 Oct	Supplementary	Kick/sweep

<i>Lymnaea palustris</i> (Muller)	<i>Rhyacophila dorsalis</i> (Curtis)
<i>Lymnaea peregra</i> (Muller)	<i>Polycentropus flavomaculatus</i> (Pictet)
<i>Succinea</i> sp.	<i>Tinodes dives</i> (Pictet)
<i>Pisidium</i> sp.	<i>Metalype fragilis</i> (Pictet)
<i>Pisidium casertanum</i> (Poli)	<i>Hydropsyche siltalai</i> Dohler
<i>Pisidium personatum</i> Malm	<i>Hydroptila</i> sp.
<i>Pisidium subtruncatum</i> Malm	<i>Drusus annulatus</i> Stephens
<i>Oligochaeta</i>	<i>Limnophilus lunatus</i> group
<i>Helobdella stagnalis</i> (L.)	<i>Limnophilus extricatus</i> McLachlan
<i>Hydracarina</i>	<i>Halesus radiatus</i> (Curtis)
<i>Gammarus pulex</i> (L.)	<i>Melampophylax mucoreus</i> (Hagen)
<i>Baetis scambus</i> group	<i>Chaetopteryx villosa</i> (Fabricius)
<i>Baetis vernus</i> Curtis	<i>Odontocerum albicorne</i> (Scopoli)
<i>Baetis rhodani</i> (Pictet)	<i>Sericostoma personatum</i> (Spence)
<i>Baetis muticus</i> (L.)	<i>Tipula montium</i> group
<i>Centroptilum luteolum</i> (Muller)	<i>Dicranota</i> sp.
<i>Centroptilum pennulatum</i> Eaton	<i>Limnophila</i> (<i>Eloeophila</i>) sp.
<i>Procloeon bifidum</i> Bengtsson	<i>Pericoma blandula</i> Eaton
<i>Rhithrogena semicolorata</i> group	<i>Pericoma neglecta</i> Eaton
<i>Ecdyonurus</i> sp.	<i>Dixa puberula</i> Loew
<i>Paraleptophlebia submarginata</i> (Stephens)	<i>Ceratopogonidae</i>
<i>Ephemerella ignita</i> (Poda)	<i>Chironomidae</i>
<i>Ephemerella danica</i> Muller	<i>Simulium</i> (<i>Nevermannia</i>) <i>cryophilum</i> group
<i>Caenis luctuosa</i> group	<i>Simulium</i> (<i>Nevermannia</i>) <i>angustitarse</i> group
<i>Caenis horaria</i> (L.)	<i>Simulium</i> (<i>Simulium</i>) <i>reptans</i> group
<i>Caenis rivulorum</i> Eaton	<i>Simulium</i> (<i>Simulium</i>) <i>ornatum</i> group
<i>Caenis pusilla</i> Navas	<i>Chelifera</i> group
<i>Amphinemura sulcicollis</i> (Stephens)	<i>Wiedemannia</i> group
<i>Leuctra geniculata</i> (Stephens)	<i>Limnophora</i> sp.
<i>Leuctra inermis</i> Kempny	
<i>Leuctra hippopus</i> (Kempny)	
<i>Leuctra fusca</i> (L.)	
<i>Perlodes microcephala</i> (Pictet)	
<i>Isoperla grammatica</i> (Poda)	
<i>Dinocras cephalotes</i> (Curtis)	
<i>Velia</i> sp.	
<i>Micronecta</i> sp.	
<i>Platambus maculatus</i> (L.)	
<i>Hydraena gracilis</i> Germar	
<i>Helophorus aequalis</i> Thomson	
<i>Helophorus brevipalpis</i> Bedel	
<i>Helophorus flavipes</i> (Fabricius)	
<i>Elodes</i> sp.	
<i>Elmis aenea</i> (Muller)	
<i>Esolus parallelepipedus</i> (Muller)	
<i>Limnius volckmari</i> (Panzer)	
<i>Oulimnius</i> sp.	
<i>Oulimnius tuberculatus</i> (Muller)	
<i>Riolus cupreus</i> (Muller)	
<i>Riolus subviolaceus</i> (Muller)	

SD 914 636	11 Apr	Main sample	3 minute kick/sweep
SD 912 633	11 Apr	Supplementary	Kick/sweep
SD 914 636	18 Jul	Main sample	3 minute kick/sweep
SD 912 633	18 Jul	Supplementary	Kick/sweep
SD 914 636	03 Oct	Main sample	3 minute kick/sweep
SD 912 633	03 Oct	Supplementary	Kick/sweep

Hydridae

Polycelis felina (Dalyell)

Crenobia alpina (Dana)

Potamopyrgus jenkinsi (Smith)

Lymnaea peregra (Muller)

Oligochaeta

Hydracarina

Gammarus pulex (L.)

Baetis rhodani (Pictet)

Baetis muticus (L.)

Centroptilum pennulatum Eaton

Rhithrogena semicolorata group

Ecdyonurus sp.

Leptophlebiidae

Ephemerella ignita (Poda)

Ephemera danica Muller

Caenis rivulorum Eaton

Protonemura praecox (Morton)

Protonemura meyeri (Pictet)

Amphinemura sulcicollis (Stephens)

Leuctra geniculata (Stephens)

Leuctra inermis Kempny

Leuctra fusca (L.)

Perlodes microcephala (Pictet)

Isoperla grammatica (Poda)

Dinocras cephalotes (Curtis)

Chloroperla torrentium (Pictet)

Oreodytes sanmarkii (Sahlberg)

Oreodytes septentrionalis (Sahlberg)

Platambus maculatus (L.)

Hydraena gracilis Germar

Helophorus brevipalpis Bedel

Helophorus flavipes (Fabricius)

Elmis aenea (Muller)

Esolus parallelepipedus (Muller)

Limnius volckmari (Panzer)

Oulimnius tuberculatus (Muller)

Riolus cupreus (Muller)

Riolus subviolaceus (Muller)

Rhyacophila dorsalis (Curtis)

Agapetus sp.

Polycentropodidae

Tinodes dives (Pictet)

Hydroptilidae

Hydroptila sp.

Limnephilidae

Drusus annulatus Stephens

Ecclisopteryx guttulata (Pictet)

Beraea maurus (Curtis)

Tipula montium group

Tipula oleracea L.

Dicranota sp.

Molophilus sp.

Pericoma sp.

Pericoma neglecta Eaton

Ceratopogonidae

Chironomidae

Simulium (Nevermannia) vernum group

Simulium (Nevermannia) cryophilum group

Simulium (Simulium) argyreatum group

Simulium (Simulium) ornatum group

Chelifera group

Wiedemannia group

Limnophora sp.

NC 631 155	16 Apr	Main sample	3 minute kick/sweep
NC 628 157	16 Apr	Supplementary	Kick/sweep
NC 631 155	08 Jul	Main sample	3 minute kick/sweep
NC 628 157	08 Jul	Supplementary	Kick/sweep
NC 631 155	14 Oct	Main sample	3 minute kick/sweep
NC 628 157	14 Oct	Supplementary	Kick/sweep

Crenobia alpina (Dana)
Lymnaea peregra (Muller)
Oligochaeta
Hydracarina
Ameletus inopinatus Eaton
Baetis scambus group
Baetis vernus Curtis
Baetis rhodani (Pictet)
Rhithrogena semicolorata group
Heptagenia lateralis (Curtis)
Ecdyonurus sp.
Leptophlebia marginata (L.)
Ephemerella ignita (Poda)
Brachyptera risi (Morton)
Protonemura sp.
Amphinemura sulcicollis (Stephens)
Leuctra inermis Kempny
Leuctra hippopus (Kempny)
Leuctra fusca (L.)
Isoperla grammatica (Poda)
Dinocras cephalotes (Curtis)
Perla bipunctata Pictet
Chloroperla torrentium (Pictet)
Oreodytes sanmarkii (Sahlberg)
Oreodytes septentrionalis (Sahlberg)
Hydrophilidae (incl. Hydraenidae)
Hydraena gracilis Germar
Elmis aenea (Muller)
Esolus parallelepipedus (Muller)
Limnius volckmari (Panzer)
Oulimnius tuberculatus (Muller)
Rhyacophila dorsalis (Curtis)
Polycentropus flavomaculatus (Pictet)
Hydropsyche siltalai Dohler
Hydroptila sp.
Ecclisopteryx guttulata (Pictet)
Dicranota sp.
Limnophila (*Eloeophila*) sp.
Hexatoma sp.
Ceratopogonidae
Chironomidae
Prosimulium hirtipes Fries
Simulium (*Nevermannia*) *cryophilum* group
Simulium (*Simulium*) *reptans* group
Simulium (*Simulium*) *argyreatum* group
Simulium (*Simulium*) *ornatum* group
Wiedemannia group

NC 789 106	15 Apr	Main sample	3 minute kick/sweep
NC 790 105	15 Apr	Supplementary	Kick/sweep
NC 789 106	09 Jul	Main sample	3 minute kick/sweep
NC 790 105	09 Jul	Supplementary	Kick/sweep
NC 789 106	14 Oct	Main sample	3 minute kick/sweep
NC 790 105	14 Oct	Supplementary	Kick/sweep

Polycelis felina (Dalyell)
Lymnaea palustris (Muller)
Lymnaea peregra (Muller)
Ancylus fluviatilis Muller
Pisidium sp.
Oligochaeta #
Hydracarina
Baetis scambus group
Baetis rhodani (Pictet)
Baetis muticus (L.)
Centroptilum luteolum (Muller)
Proclonia bifidum Bengtsson
Rhithrogena semicolorata group
Heptagenia sulphurea (Muller)
Ecdyonurus sp.
Leptophlebia marginata (L.)
Paraleptophlebia submarginata (Stephens)
Ephemerella ignita (Poda)
Caenis rivulorum Eaton
Brachyptera sp.
Brachyptera putata (Newman)
Brachyptera risi (Morton)
Protonemura praecox (Morton)
Protonemura meyeri (Pictet)
Amphinemura sulcicollis (Stephens)
Nemoura avicularis Morton
Leuctra inermis Kempny
Leuctra hippopus (Kempny)
Leuctra fusca (L.)
Isoperla grammatica (Poda)
Dinocras cephalotes (Curtis)
Perla bipunctata Pictet
Chloroperla torrentium (Pictet)
Chloroperla tripunctata (Scopoli)
Oreodytes septentrionalis (Sahlberg)
Orectochilus villosus (Muller)
Hydraena gracilis Germar
Elodes sp.
Elmis aenea (Muller)
Esolus parallelepipedus (Muller)
Limnius volckmari (Panzer)
Oulimnius sp.
Oulimnius tuberculatus (Muller)
Sialis lutaria (L.)
Rhyacophila dorsalis (Curtis)
Glossosoma sp.
Agapetus sp.
Wormaldia sp.
Polycentropus flavomaculatus (Pictet)
Hydropsyche pellucidula (Curtis)
Hydropsyche siltalai Dohler
Hydroptila sp.

Limnephilidae
Potamophylax latipennis (Curtis)
Odontocerum albicorne (Scopoli)
Athripsodes sp.
Athripsodes commutatus (Rostock)
Lepidostoma hirtum (Fabricius)
Brachycentrus subnubilus Curtis
Sericostoma personatum (Spence)
Tipula montium group
Antocha vitripennis Meigen
Dicranota sp.
Hexatoma sp.
Pericoma fallax Eaton
Ceratopogonidae
Chironomidae
Simulium (Nevermannia) *cryophilum* group
Simulium (Simulium) *reptans* group
Simulium (Simulium) *argyreatum* group
Simulium (Simulium) *argyreatum* Meigen
Wiedemannia group
Atherix ibis (Fabricius)

NC 870 046	14 Apr	Main sample	3 minute kick/sweep
NC 871 045	14 Apr	Supplementary	Kick/sweep
NC 870 046	08 Jul	Main sample	3 minute kick/sweep
NC 871 045	08 Jul	Supplementary	Kick/sweep
NC 870 046	16 Oct	Main sample	3 minute kick/sweep
NC 871 045	16 Oct	Supplementary	Kick/sweep

Lymnaea palustris (Muller)
Lymnaea peregra (Muller)
Bathymphalus contortus (L.)
Zonitoides nitidus (Muller)
Pisidium casertanum (Poli)
Pisidium hibernicum Westerlund
Pisidium nitidum Jenyns
Oligochaeta
Glossiphonia complanata (L.)
Helobdella stagnalis (L.)
Hydracarina
Baetis scambus group
Baetis rhodani (Pictet)
Baetis muticus (L.)
Centroptilum luteolum (Muller)
Rhithrogena semicolorata group
Ecdyonurus sp.
Leptophlebia marginata (L.)
Ephemerella ignita (Poda)
Caenis horaria (L.)
Caenis rivulorum Eaton
Amphinemura sulcicollis (Stephens)
Nemoura cinerea (Retzius)
Leuctra inermis Kempny
Leuctra hippopus (Kempny)
Leuctra fusca (L.)
Perlodes microcephala (Pictet)
Isoperla grammatica (Poda)
Chloroperla torrentium (Pictet)
Velia sp.
Micronecta poweri (Douglas & Scott)
Oreodytes septentrionalis (Sahlberg)
Hydrophilidae (incl. Hydraenidae)
Elmis aenea (Muller)
Oulimnius sp.
Oulimnius tuberculatus (Muller)
Rhyacophila dorsalis (Curtis)
Neureclipsis bimaculata (L.)
Polycentropus flavomaculatus (Pictet)
Hydropsyche pellucidula (Curtis)
Hydropsyche siltalai Dohler
Agraylea multipunctata Curtis
Hydroptila sp.
Oxyethira sp.
Limnephilidae
Anabolia nervosa (Curtis)
Potamophylax group
Ceraclea sp.
Ceraclea annulicornis (Stephens)
Lepidostoma hirtum (Fabricius)
Sericostoma personatum (Spence)

Tipula montium group
Pericoma fallax Eaton
Pericoma trivialis group
Ceratopogonidae
Chironomidae
Simulium (Nevermannia) vernum group
Simulium (Simulium) reptans group
Simulium (Simulium) argyreatum group
Simulium (Simulium) ornatum group
Wiedemannia group
Dolichopodidae
Muscidae
Limnophora sp.

NC 684 202	15 Apr	Main sample	3 minute kick/sweep
NC 686 200	15 Apr	Supplementary	Kick/sweep
NC 684 202	09 Jul	Main sample	3 minute kick/sweep
NC 686 200	09 Jul	Supplementary	Kick/sweep
NC 684 202	15 Oct	Main sample	3 minute kick/sweep
NC 686 200	15 Oct	Supplementary	Kick/sweep

Crenobia alpina (Dana)
Oligochaeta
Hydracarina
Ameletus inopinatus Eaton
Baetis scambus group
Baetis rhodani (Pictet)
Rhithrogena semicolorata group
Ephemerella ignita (Poda)
Brachyptera putata (Newman)
Brachyptera risi (Morton)
Protonemura praecox (Morton)
Protonemura meyeri (Pictet)
Amphinemura sulcicollis (Stephens)
Leuctra inermis Kempny
Leuctra hippopus (Kempny)
Leuctra fusca (L.)
Perlodes microcephala (Pictet)
Isoperla grammatica (Poda)
Dinocras cephalotes (Curtis)
Chloroperla torrentium (Pictet)
Oreodytes sanmarkii (Sahlberg)
Oreodytes septentrionalis (Sahlberg)
Hydrophilidae (incl. Hydraenidae)
Elmis aenea (Muller)
Esolus parallelepipedus (Muller)
Limnius volckmari (Panzer)
Rhyacophila dorsalis (Curtis)
Plectrocnemia conspersa (Curtis)
Polycentropus flavomaculatus (Pictet)
Hydropsyche siltalai Dohler
Agraylea multipunctata Curtis
Hydroptila sp.
Limnephilidae
Ecclisopteryx guttulata (Pictet)
Chaetopteryx villosa (Fabricius)
Brachycentrus subnubilus Curtis
Dolichopeza albipes (Strom)
Tipula montium group
Limonia sp.
Trichyphona sp.
Dicranota sp.
Limnophila (*Eloeophila*) sp.
Hexatoma sp.
Chironomidae
Prosimulium hirtipes Fries
Simulium (*Nevermannia*) *vernum* group
Simulium (*Simulium*) *reptans* group
Simulium (*Simulium*) *argyreatum* group
Simulium (*Simulium*) *ornatum* group
Wiedemannia group

NC 747 160	15 Apr	Main sample	3 minute kick/sweep
NC 748 161	15 Apr	Supplementary	Kick/sweep
NC 747 160	09 Jul	Main sample	3 minute kick/sweep
NC 748 161	09 Jul	Supplementary	Kick/sweep
NC 747 160	15 Oct	Main sample	3 minute kick/sweep
NC 748 161	15 Oct	Supplementary	Kick/sweep

Lymnaea peregra (Muller)
Ancylus fluviatilis Muller
Zonitoides nitidus (Muller)
Pisidium sp.
Oligochaeta
Hydracarina
Ameletus inopinatus Eaton
Baetis scambus group
Baetis rhodani (Pictet)
Baetis niger (L.)
Centroptilum luteolum (Muller)
Rhithrogena semicolorata group
Ecdyonurus sp.
Leptophlebia marginata (L.)
Paraleptophlebia submarginata (Stephens)
Ephemerella ignita (Poda)
Caenis rivulorum Eaton
Brachyptera putata (Newman)
Protonemura praecox (Morton)
Protonemura meyeri (Pictet)
Amphinemura sulcicollis (Stephens)
Leuctra inermis Kempny
Leuctra hippopus (Kempny)
Leuctra fusca (L.)
Perlodes microcephala (Pictet)
Isoperla grammatica (Poda)
Dinocras cephalotes (Curtis)
Perla bipunctata Pictet
Chloroperla torrentium (Pictet)
Oreodytes sanmarkii (Sahlberg)
Oreodytes septentrionalis (Sahlberg)
Elmis aenea (Muller)
Esolus parallelepipedus (Muller)
Limnius volckmari (Panzer)
Oulimnius sp.
Rhyacophila dorsalis (Curtis)
Glossosoma sp.
Plectrocnemia conspersa (Curtis)
Polycentropus flavomaculatus (Pictet)
Hydropsyche pellucidula (Curtis)
Hydropsyche siltalai Dohler
Agraylea multipunctata Curtis
Hydroptila sp.
Limnephilidae
Halesus radiatus (Curtis)
Brachycentrus subnubilus Curtis
Sericostoma personatum (Spence)
Tipula montium group
Dicranota sp.
Limnophila (*Eloeophila*) sp.
Hexatoma sp.

Chironomidae
Simulium (*Nevermannia*) *vernum* group
Simulium (*Nevermannia*) *cryophilum* group
Simulium (*Simulium*) group
Simulium (*Simulium*) *reptans* group
Simulium (*Simulium*) *argyreatum* group
Empididae
Wiedemannia group

NC 259 447	17 Apr	Main sample	3 minute kick/sweep
NC 257 447	17 Apr	Supplementary	Kick/sweep
NC 259 447	11 Jul	Main sample	3 minute kick/sweep
Nc 257 447	11 Jul	Supplementary	Kick/sweep
NC 259 447	16 Oct	Main sample	3 minute kick/sweep
NC 257 447	16 Oct	Supplementary	Kick/sweep

Crenobia alpina (Dana)	Tipula montium group
Lymnaea peregra (Muller)	Dicranota sp.
Pisidium casertanum (Poli)	Molophilus sp.
Pisidium hibernicum Westerlund	Chironomidae
Pisidium nitidum Jenyns	Simulium (Simulium) reptans group
Oligochaeta	Simulium (Simulium) argyreatum group
Glossiphonia complanata (L.)	Simulium (Simulium) ornatum group
Helobdella stagnalis (L.)	Chelifera group
Erpobdellidae	Wiedemannia group
Dina lineata (Muller)	
Hydracarina	
Baetis scambus group	
Baetis rhodani (Pictet)	
Baetis muticus (L.)	
Centroptilum luteolum (Muller)	
Rhithrogena semicolorata group	
Heptagenia lateralis (Curtis)	
Ecdyonurus sp.	
Leptophlebia marginata (L.)	
Ephemerella ignita (Poda)	
Caenis rivulorum Eaton	
Amphinemura sulcicollis (Stephens)	
Leuctra inermis Kempny	
Leuctra hippopus (Kempny)	
Leuctra fusca (L.)	
Perlodes microcephala (Pictet)	
Perla bipunctata Pictet	
Chloroperla torrentium (Pictet)	
Chloroperla tripunctata (Scopoli)	
Cordulegaster boltonii (Donovan)	
Potamonectes sp.	
Oreodytes sanmarkii (Sahlberg)	
Limnius volckmari (Panzer)	
Oulimnius sp.	
Oulimnius tuberculatus (Muller)	
Rhyacophila dorsalis (Curtis)	
Agapetus sp.	
Neureclipsis bimaculata (L.)	
Polycentropus flavomaculatus (Pictet)	
Hydropsyche pellucidula (Curtis)	
Hydropsyche siltalai Dohler	
Hydroptila sp.	
Oxyethira sp.	
Limnephilidae	
Ecclisopteryx guttulata (Pictet)	
Athripsodes sp.	
Athripsodes commutatus (Rostock)	
Mystacides sp.	
Mystacides azurea (L.)	
Lepidostoma hirtum (Fabricius)	
Sericostoma personatum (Spence)	

TA 010 576	22 Apr	Main sample	3 minute kick/sweep
TA 012 575	22 Apr	Supplementary	Kick/sweep
TA 010 576	28 Jul	Main sample	3 minute kick/sweep
TA 012 575	28 Jul	Supplementary	Kick/sweep
TA 010 576	10 Oct	Main sample	3 minute kick/sweep
TA 012 575	10 Oct	Supplementary	Kick/sweep

Polycelis nigra group
Polycelis felina (Dalyell)
Crenobia alpina (Dana)
Dendrocoelum lacteum (Muller)
Potamopyrgus jenkinsi (Smith)
Lymnaea palustris (Muller)
Lymnaea peregra (Muller)
Physa fontinalis (L.)
Anisus leucostoma (Millet)
Acroloxus lacustris (L.)
Ancylus fluviatilis Muller
Pisidium sp.
Pisidium subtruncatum Malm
Pisidium nitidum Jenyns
Oligochaeta
Piscicola geometra (L.)
Glossiphonia complanata (L.)
Erpobdella octoculata (L.)
Hydracarina
Gammarus pulex (L.)
Baetis vernus Curtis
Baetis rhodani (Pictet)
Ephemerella ignita (Poda)
Amphinemura standfussi Ris
Nemurella picteti Klapalek
Oreodytes sanmarkii (Sahlberg)
Elmis aenea (Muller)
Limnius volckmari (Panzer)
Rhyacophila dorsalis (Curtis)
Agapetus sp.
Limnephilidae
Limnephilus lunatus group
Potamophylax group
Halesus radiatus (Curtis)
Melampophylax mucoreus (Hagen)
Chaetopteryx villosa (Fabricius)
Silo nigricornis (Pictet)
Sericostoma personatum (Spence)
Dicranota sp.
Limnophila (*Eloeophila*) sp.
Pericoma neglecta Eaton
Ptychoptera paludosa Meigen
Dixa nebulosa Meigen
Ceratopogonidae
Chironomidae
Simulium (*Nevermannia*) *cryophilum* group
Simulium (*Nevermannia*) *costatum* Friederichs
Simulium (*Simulium*) *ornatum* group
Chelifera group

TA 064 559	21 Apr	Main sample	3 minute kick/sweep
TA 062 561	21 Apr	Supplementary	Kick/sweep
TA 064 559	28 Jul	Main sample	3 minute kick/sweep
TA 062 561	28 Jul	Supplementary	Kick/sweep
TA 064 559	11 Oct	Main sample	3 minute kick/sweep
TA 062 561	11 Oct	Supplementary	Kick/sweep

Polycelis nigra group
Polycelis felina (Dalyell)
Dendrocoelum lacteum (Muller)
Valvata piscinalis (Muller)
Physa fontinalis (L.)
Planorbis planorbis (L.)
Anisus vortex (L.)
Gyraulus albus (Muller)
Ancylus fluviatilis Muller
Sphaerium corneum (L.)
Pisidium milium Held
Pisidium nitidum Jenyns
Oligochaeta
Piscicola geometra (L.)
Theromyzon tessulatum (Muller)
Glossiphonia complanata (L.)
Helobdella stagnalis (L.)
Erpobdella octoculata (L.)
Hydracarina
Asellus aquaticus (L.)
Gammarus pulex (L.)
Baetis scambus group
Baetis vernus Curtis
Baetis rhodani (Pictet)
Centroptilum luteolum (Muller)
Cloeon dipterum (L.)
Ephemerella ignita (Poda)
Sigara dorsalis group
Brychius elevatus (Panzer)
Haliplus sp.
Potamonectes depressus (Fabricius)
Stictotarsus duodecimpustulatus (Fabricius)
Ilybius sp.
Helophorus brevipalpis Bedel
Elmis aenea (Muller)
Sialis lutaria (L.)
Rhyacophila sp.
Rhyacophila dorsalis (Curtis)
Agapetus sp.
Polycentropus flavomaculatus (Pictet)
Hydropsyche siltalai Dohler
Agraylea multipunctata Curtis
Agraylea sexmaculata Curtis
Hydroptila sp.
Oxyethira sp.
Limnephilus lunatus group
Anabolia nervosa (Curtis)
Melampophylax mucoreus (Hagen)
Athripsodes cinereus (Curtis)
Goera pilosa (Fabricius)

Tipula montium group
Dicranota sp.
 Psychodidae
Pericoma trivialis group
Dixa nebulosa Meigen
 Ceratopogonidae
 Chironomidae
Simulium (Nevermannia) angustitarse group
Simulium (Wilhelmia) sp.
Simulium (Boophthora) erythrocephalum De Geer
Simulium (Simulium) ornatum group
 Chelifera group
 Atalanta group
 Limnophora sp.

TA 066 529	21 Apr	Main sample	1 dredge + 1 minute sweep
TA 064 529	21 Apr	Supplementary	Kick/sweep
TA 066 529	28 Jul	Main sample	3 dredges + 1 minute sweep
TA 064 529	28 Jul	Supplementary	Kick/sweep
TA 066 529	10 Oct	Main sample	1 dredge + 1 minute sweep
TA 064 529	10 Oct	Supplementary	Kick/sweep

Spongillidae

Hydridae

Polycelis nigra group

Dendrocoelum lacteum (Muller)

Valvata cristata Muller

Valvata piscinalis (Muller)

Bithynia tentaculata (L.)

Lymnaea auricularia (L.)

Lymnaea peregra (Muller)

Physa fontinalis (L.)

Planorbis carinatus Muller

Anisus vortex (L.)

Gyraulus albus (Muller)

Acroloxus lacustris (L.)

Sphaerium corneum (L.)

Pisidium milium Held

Pisidium subtruncatum Malm

Pisidium henslowanum (Sheppard)

Pisidium nitidum Jenyns

Oligochaeta

Piscicola geometra (L.)

Theromyzon tessulatum (Muller)

Hemiclepsis marginata (Muller)

Glossiphonia complanata (L.)

Helobdella stagnalis (L.)

Erpobdella testacea (Savigny)

Erpobdella octoculata (L.)

Hydracarina

Asellus aquaticus (L.)

Asellus meridianus Racovitza

Crangonyx pseudogracilis Bousfield

Gammarus pulex (L.)

Baetis vernus Curtis

Centroptilum luteolum (Muller)

Cloeon dipterum (L.)

Cloeon simile Eaton

Caenis horaria (L.)

Gerris lacustris (L.)

Notonecta sp.

Callicorixa praeusta (Fieber)

Sigara dorsalis group

Sigara falleni (Fieber)

Brychius elevatus (Panzer)

Haliplus lineatocollis (Marshall)

Haliplus fluviatilis Aube

Haliplus wehnckeii Gerhardt

Potamonectes depressus (Fabricius)

Stictotarsus duodecimpustulatus (Fabricius)

Oreodytes sanmarkii (Sahlberg)

Hydroporus palustris (L.)

Platambus maculatus (L.)

Helophorus brevipalpis Bedel

Elmis aenea (Muller)

Sialis lutaria (L.)

Polycentropus flavomaculatus (Pictet)

Cyrnus trimaculatus (Curtis)

Lype sp.

Agralyea multipunctata Curtis

Phryganea grandis group

Limnephilus rhombicus (L.)

Limnephilus lunatus group

Anabolia nervosa (Curtis)

Halesus radiatus (Curtis)

Molanna angustata Curtis

Athripsodes aterrimus (Stephens)

Athripsodes cinereus (Curtis)

Mystacides sp.

Chironomidae

Simulium (Nevermannia) angustitarse group

Simulium (Boophthora) erythrocephalum De Geer

Empididae

Hemerodromia group

TA 084 614	22 Apr	Main sample	3 minute kick/sweep
TA 084 615	22 Apr	Supplementary	Kick/sweep
TA 084 614	28 Jul	Main sample	3 minute kick/sweep
TA 084 615	28 Jul	Supplementary	Kick/sweep
TA 084 614	11 Oct	Main sample	3 minute kick/sweep
TA 084 615	11 Oct	Supplementary	Kick/sweep

Polycelis nigra group
 Polycelis felina (Dalyell)
 Potamopyrgus jenkinsi (Smith)
 Lymnaea peregra (Muller)
 Physa fontinalis (L.)
 Bathyomphalus contortus (L.)
 Ancylus fluviatilis Muller
 Pisidium subtruncatum Malm
 Pisidium nitidum Jenyns
 Oligochaeta
 Piscicola geometra (L.)
 Theromyzon tessulatum (Muller)
 Glossiphonia complanata (L.)
 Helobdella stagnalis (L.)
 Erpobdella octoculata (L.)
 Hydracarina
 Asellus aquaticus (L.)
 Asellus meridianus Racovitza
 Gammarus pulex (L.)
 Baetis vernus Curtis
 Baetis rhodani (Pictet)
 Centroptilum luteolum (Muller)
 Ephemerella ignita (Poda)
 Nemurella picteti Klapalek
 Velia sp.
 Hesperocorixa sahlbergi (Fieber)
 Sigara dorsalis group
 Sigara lateralis (Leach)
 Brychius elevatus (Panzer)
 Halipus sp.
 Agabus sp.
 Helophorus brevipalpis Bedel
 Helophorus grandis Illiger
 Elodes sp.
 Elmis aenea (Muller)
 Sialis lutaria (L.)
 Rhyacophila dorsalis (Curtis)
 Agapetus sp.
 Hydroptila sp.
 Oxyethira sp.
 Limnephilus lunatus group
 Limnephilus extricatus McLachlan
 Potamophylax group
 Potamophylax latipennis (Curtis)
 Melampophylax mucoreus (Hagen)
 Chaetopteryx villosa (Fabricius)
 Silo nigricornis (Pictet)
 Sericostoma personatum (Spence)
 Tipula montium group
 Dicranota sp.
 Limnophila (Eloeophila) sp.

Ceratopogonidae
 Chironomidae
 Simulium (Simulium) ornatum group
 Chelifera group
 Atalanta group
 Ephidridae

TA 092 551	22 Apr	Main sample	1 dredge + 1 minute sweep
TA 093 545	22 Apr	Supplementary	Kick/sweep
TA 092 551	27 Jul	Main sample	1 dredge + 1 minute sweep
TA 093 545	27 Jul	Supplementary	Kick/sweep
TA 092 551	11 Oct	Main sample	1 dredge + 1 minute sweep
TA 093 545	11 Oct	Supplementary	Kick/sweep

Polycelis nigra group	Tipula montium group
Valvata piscinalis (Muller)	Pericoma neglecta Eaton
Potamopyrgus jenkinsi (Smith)	Dixa nebulosa Meigen
Lymnaea palustris (Muller)	Ceratopogonidae
Physa fontinalis (L.)	Chironomidae
Planorbis carinatus Muller	Simulium (Nevermannia) angustitarse group
Anisus vortex (L.)	Simulium (Eusimulium) aureum group
Bathyomphalus contortus (L.)	Atalanta group
Succinea sp.	Sciomyzidae
Sphaerium corneum (L.)	
Pisidium amnicum (Muller)	
Pisidium milium Held	
Pisidium subtruncatum Malm	
Pisidium nitidum Jenyns	
Oligochaeta	
Piscicola geometra (L.)	
Theromyzon tessulatum (Muller)	
Glossiphonia complanata (L.)	
Helobdella stagnalis (L.)	
Erpobdella octoculata (L.)	
Hydracarina	
Asellus aquaticus (L.)	
Crangonyx pseudogracilis Bousfield	
Gammarus pulex (L.)	
Baetis vernus Curtis	
Centroptilum luteolum (Muller)	
Cloeon dipterum (L.)	
Cloeon simile Eaton	
Ephemerella ignita (Poda)	
Caenis horaria (L.)	
Ischnura elegans (Van der Linden)	
Velia sp.	
Gerris lacustris (L.)	
Hesperocorixa sahlbergi (Fieber)	
Sigara dorsalis group	
Sigara distincta (Fieber)	
Sigara falleni (Fieber)	
Brychius elevatus (Panzer)	
Haliphus lineatocollis (Marshall)	
Haliphus fluviatilis Aube	
Haliphus wehnckeii Gerhardt	
Potamonectes depressus (Fabricius)	
Stictotarsus duodecimpustulatus (Fabricius)	
Agabus sp.	
Agabus paludosus (Fabricius)	
Platambus maculatus (L.)	
Helophorus brevipalpis Bedel	
Laccobius minutus (L.)	
Elmis aenea (Muller)	
Sialis lutaria (L.)	
Limnephilus lunatus group	
Athripsodes aterrimus (Stephens)	
Sericostoma personatum (Spence)	

NY 711 306	13 Apr	Main sample	3 minute kick/sweep
NY 714 308	13 Apr	Supplementary	Kick/sweep
NY 711 306	20 Jul	Main sample	3 minute kick/sweep
NY 714 308	20 Jul	Supplementary	Kick/sweep
NY 711 306	18 Oct	Main sample	3 minute kick/sweep
NY 714 308	18 Oct	Supplementary	Kick/sweep

Crenobia alpina (Dana)
Oligochaeta
Hydracarina
Gammarus pulex (L.)
Ameletus inopinatus Eaton
Baetis vernus Curtis
Baetis rhodani (Pictet)
Baetis muticus (L.)
Rhithrogena semicolorata group
Ecdyonurus sp.
Ephemerella ignita (Poda)
Taeniopteryx nebulosa (L.)
Brachyptera risi (Morton)
Protonemura praecox (Morton)
Protonemura montana Kimmins
Protonemura meyeri (Pictet)
Amphinemura sp.
Amphinemura sulcicollis (Stephens)
Nemoura cambrica group
Leuctra inermis Kempny
Leuctra fusca (L.)
Diura bicaudata (L.)
Isoperla grammatica (Poda)
Oreodytes sanmarkii (Sahlberg)
Hydraena gracilis Germar
Helophorus aequalis Thomson
Helophorus brevipalpis Bedel
Elodes sp.
Elmis aenea (Muller)
Limnius volckmari (Panzer)
Oulimnius tuberculatus (Muller)
Rhyacophila dorsalis (Curtis)
Rhyacophila oblitterata McLachlan
Glossosoma sp.
Philopotamus montanus (Donovan)
Plectrocnemia conspersa (Curtis)
Drusus annulatus Stephens
Potamophylax group
Potamophylax cingulatus (Stephens)
Melampophylax mucoreus (Hagen)
Chaetopteryx villosa (Fabricius)
Beraea maurus (Curtis)
Dicranota sp.
Pericoma neglecta Eaton
Dixa puberula Loew
Chironomidae
Simulium (Nevermannia) *cryophilum* group
Simulium (Simulium) *argyreatum* group
Wiedemannia group

5.2 Species x site matrix for each river in each season

The following printouts list the species recorded in each of the river systems sampled in 1989. Site names for each river (or tributary) are given at the head of each printout, together with grid references and sampling dates. To the left of each river and site name appears a site code (e.g. 81 Cowside Beck, Nab End). The code 81 then acts as a heading for the three columns of data relating to that site.

The three columns are, from left to right

Spring (12 April at this site)

Summer (18 July)

Autumn (3 October)

+indicates present in main sample

S indicates additional species recorded in the supplementary sample

0 indicates absent in main and supplementary sample

	Pages
Cowside Beck/Gordale Beck	25
Brora/Blackwater	28
Laxford	31
Hull/Kelk Beck	33
Knock Ore Gill	36

81	Cowside Beck	Nab End	SD 900701 - SD 903700	12 Apr	18 Jul	03 Oct
85	Cowside Beck	Arncliffe	SD 929718 - SD 930719	12 Apr	19 Jul	03 Oct
91	Gordale Beck	Seaty Hill	SD 912653 - SD 912654	12 Apr	18 Jul	03 Oct
95	Gordale Beck	Gordale Bridge	SD 912633 - SD 914636	11 Apr	18 Jul	03 Oct

81	85	91	95
----	----	----	----

Hydridae	000	000	000	0S+
Polycelis felina	00S	000	000	0+0
Crenobia alpina	+00	+00	000	SSS
Potamopyrgus jenkinsi	000	000	000	+++
Lymnaea palustris	+00	000	+00	000
Lymnaea peregra	+++	+++	+++	+++
Ancylus fluviatilis	000	0++	000	000
Succinea sp.	000	S00	+0+	000
Zonitoides nitidus	000	+00	000	000
Pisidium sp.	000	000	+00	000
Pisidium casertanum	0+0	000	0++	000
Pisidium personatum	000	000	00+	000
Pisidium subtruncatum	000	000	00+	000
Oligochaeta	+++	+++	+++	+++
Helobdella stagnalis	000	000	0S+	000
Hydracarina	0S+	+++	+++	S++
Gammarus pulex	+++	000	+++	+++
Ameletus inopinatus	+00	000	000	000
Baetis scambus group	0S+	0++	00+	000
Baetis vernus	000	000	00+	000
Baetis rhodani	+++	+++	+++	+++
Baetis muticus	+++	++0	+++	+++
Centroptilum luteolum	000	000	+++	000
Centroptilum pennulatum	0+0	0+0	0+S	00S
Procloeon bifidum	0++	000	00+	000
Rhithrogena semicolorata group	+++	+++	+0+	+++
Heptagenia sulphurea	000	00+	000	000
Heptagenia lateralis	+0+	+00	000	000
Ecdyonurus sp.	+++	+++	+++	+++
Leptophlebiidae	000	000	000	00S
Paraleptophlebia submarginata	00+	00+	+0+	000
Habrophlebia fusca	0+0	000	000	000
Ephemerella ignita	0+S	S+0	0+0	++S
Ephemera danica	000	000	+0+	0+0
Caenis luctuosa group	000	000	00+	000
Caenis horaria	000	000	00+	000
Caenis rivulorum	00+	+++	+0+	00S
Caenis pusilla	000	000	0S0	000
Protonemura praecox	00+	000	000	00S
Protonemura meyeri	+0+	00+	000	+++
Amphinemura sulcicollis	+0+	+0+	+00	+0+
Nemoura avicularis	000	00+	000	000
Nemoura cambrica group	+00	000	000	000
Leuctra geniculata	0+0	000	00S	0+0
Leuctra inermis	+++	+00	+0S	+0S
Leuctra hippopus	+0+	00+	+0+	000
Leuctra nigra	00S	000	000	000
Leuctra fusca	0+0	0+0	0+0	0++
Perlodes microcephala	00+	000	+0+	00S
Isoperla grammatica	+0+	+0+	+0+	+0+

Dinocras cephalotes	+++	0++	+++	+++
Perla bipunctata	000	SS+	000	000
Chloroperla torrentium	+0S	+00	000	+00
Chloroperla tripunctata	000	+0+	000	000
Velia sp.	000	000	+00	000
Micronecta sp.	000	000	00S	000
Brychius elevatus	000	0++	000	000
Oreodytes sanmarkii	++0	S+0	000	0+S
Oreodytes septentrionalis	000	000	000	0S0
Platambus maculatus	000	00+	0++	00S
Hydraena gracilis	0++	0++	0+S	0S+
Helophorus aequalis	000	000	0+0	000
Helophorus arvernicus	000	+00	000	000
Helophorus brevipalpis	0S0	000	0+0	0+0
Helophorus flavipes	000	000	0S0	0+0
Elodes sp.	000	000	+0S	000
Elmis aenea	+++	+++	+++	+++
Esolus parallelepipedus	0++	+++	0++	+++
Limnius volckmari	+++	S++	+++	+++
Oulimnius sp.	000	000	+0+	000
Oulimnius tuberculatus	000	0++	0+0	0+0
Riolus cupreus	000	00+	+S0	+++
Riolus subviolaceus	+++	00+	+++	+S+
Rhyacophila dorsalis	+++	S++	SS+	++0
Rhyacophila oblitterata	0S0	000	000	000
Rhyacophila munda	0+0	000	000	000
Glossosoma sp.	000	0++	000	000
Agapetus sp.	000	00+	000	+0+
Polycentropodidae	000	000	000	00+
Plectrocnemia conspersa	+00	000	000	000
Polycentropus flavomaculatus	+++	0++	+++	000
Tinodes dives	000	00+	00S	+00
Metalype fragilis	000	00+	+0+	000
Psychomyia pusilla	000	00+	000	000
Hydropsyche sp.	000	00+	000	000
Hydropsyche pellucidula	000	00S	000	000
Hydropsyche instabilis	00S	000	000	000
Hydropsyche siltalai	00+	00+	00S	000
Hydroptilidae	000	000	000	S00
Hydroptila sp.	00+	0++	+++	0+0
Ithytrichia sp.	000	00+	000	000
Limnephilidae	0S0	0+0	000	0+0
Drusus annulatus	+00	+00	+00	+S+
Ecclisopteryx guttulata	+0+	+0+	000	+0+
Limnephilus lunatus group	000	000	+00	000
Limnephilus extricatus	000	000	00+	000
Potamophylax group	000	00+	000	000
Potamophylax latipennis	000	0+0	000	000
Halesus radiatus	000	000	+00	000
Melampophylax mucoreus	+00	000	+0+	000
Allogamus auricollis	000	+00	000	000
Chaetopteryx villosa	000	000	0+0	000
Beraea maurus	000	000	000	00S
Odontocerum albicorne	000	000	+++	000
Lepidostoma hirtum	000	00+	000	000
Sericostoma personatum	000	00+	+0S	000
Tipula montium group	00+	+++	0++	+++

Tipula oleracea	000	000	000	0S0
Antocha vitripennis	000	00+	000	000
Dicranota sp.	+++	+S+	+++	+++
Limnophila (Eloeophila) sp.	00+	000	00+	000
Molophilus sp.	000	000	000	S00
Hexatoma sp.	0S+	+++	000	000
Pericoma sp.	00+	+00	000	+0+
Pericoma blandula	000	000	00S	000
Pericoma diversa	0+0	000	000	000
Pericoma exquisita	000	00+	000	000
Pericoma neglecta	+++	S+0	++S	+++
Dixa puberula	000	000	00+	000
Ceratopogonidae	0SS	S0+	00+	0S0
Chironomidae	+++	+++	+++	+++
Simulium (Nevermannia) vernum group	000	000	000	0+0
Simulium (Nevermannia) cryophilum group	++0	0++	0+S	0++
Simulium (Nevermannia) angustitarse group	000	000	00+	000
Simulium (Eusimulium) aureum group	000	0++	000	000
Simulium (Simulium) reptans group	000	0++	00+	000
Simulium (Simulium) argyreatum group	++0	0+0	000	+00
Simulium (Simulium) variegatum	00+	+++	000	000
Simulium (Simulium) ornatum group	000	00+	0+0	0SS
Empididae	000	+00	000	000
Chelifera group	000	0+0	+S0	00+
Wiedemannia group	+++	0++	+++	+S+
Atherix ibis	000	0+0	000	000
Limnophora sp.	00+	0++	00S	00+

RIVER SYSTEM 89 BRORA/BLACKWATER 1989

05	Brora	Dalnessie	NC 628157 - NC 631155	16 Apr	08 Jul	14 Oct
09	Brora	u/s Balnacoil	NC 789106 - NC 790105	15 Apr	09 Jul	14 Oct
13	Brora	d/s Loch Brora	NC 870046 - NC 871045	14 Apr	08 Jul	16 Oct
21	Blackwater	Creag Dhubh	NC 684202 - NC 686200	15 Apr	09 Jul	15 Oct
25	Blackwater	Pollie	NC 747160 - NC 748161	15 Apr	09 Jul	15 Oct

	05	09	13	21	25
Polycelis felina	000	++0	000	000	000
Crenobia alpina	+00	000	000	+00	000
Lymnaea palustris	000	00+	S0+	000	000
Lymnaea peregra	00+	+++	+++	000	+++
Bathyomphalus contortus	000	000	+++	000	000
Ancylus fluviatilis	000	00S	000	000	0SS
Zonitoides nitidus	000	000	00+	000	+00
Pisidium sp.	000	+00	000	000	S00
Pisidium casertanum	000	000	0+0	000	000
Pisidium hibernicum	000	000	0++	000	000
Pisidium nitidum	000	000	++S	000	000
Oligochaeta	+++	+S+	+++	+++	+++
Glossiphonia complanata	000	000	+++	000	000
Helobdella stagnalis	000	000	+00	000	000
Hydracarina	++0	++0	++0	SS0	+S0
Ameletus inopinatus	S00	000	000	+00	+00
Baetis scambus group	0++	0+0	0+0	0+0	0+0
Baetis vernus	0+0	000	000	000	000
Baetis rhodani	++0	++S	++0	++S	++S
Baetis muticus	000	+00	++0	000	000
Baetis niger	000	000	000	000	00+
Centroptilum luteolum	000	+00	+S0	000	+00
Procloeon bifidum	000	00+	000	000	000
Rhithrogena semicolorata group	+0+	+0+	+00	+0S	+0+
Heptagenia sulphurea	000	+00	000	000	000
Heptagenia lateralis	+00	000	000	000	000
Ecdyonurus sp.	0++	+++	+++	000	+++
Leptophlebia marginata	00+	00+	+0S	000	00+
Paraleptophlebia submarginata	000	+0S	000	000	00+
Ephemerella ignita	0+0	0+0	0+0	0+0	0+0
Caenis horaria	000	000	00S	000	000
Caenis rivulorum	000	SS0	++S	000	S+S
Brachyptera sp.	000	00+	000	000	000
Brachyptera putata	000	00S	000	00S	00S
Brachyptera risi	S00	S00	000	+00	000
Protonemura sp.	0+0	000	000	000	000
Protonemura praecox	000	00+	000	00S	00S
Protonemura meyeri	000	00+	000	+0S	+00
Amphinemura sulcicollis	+00	+0+	+00	+00	+0S
Nemoura cinerea	000	000	+00	000	000
Nemoura avicularis	000	00+	000	000	000
Leuctra inermis	+00	+00	+00	+0+	+0S
Leuctra hippopus	00+	+0+	+0+	+0+	00+
Leuctra fusca	0+0	0+0	0+0	0+0	0+S
Perlodes microcephala	000	000	+00	+++	+00
Isoperla grammatica	+0+	+0S	+00	+00	+00
Dinocras cephalotes	+S0	++0	000	+00	++S
Perla bipunctata	++0	SS+	000	000	+++
Chloroperla torrentium	+00	+00	+00	+0S	+00
Chloroperla tripunctata	000	0S0	000	000	000

Velia sp.	000	000	0S0	000	000
Micronecta poweri	000	000	0S0	000	000
Oreodytes sanmarkii	0+0	000	000	+00	0+0
Oreodytes septentrionalis	0+0	+00	S00	+00	S00
Orectochilus villosus	000	00+	000	000	000
Hydrophilidae (incl. Hydraenidae)	00+	000	00+	00S	000
Hydraena gracilis	0+0	S00	000	000	000
Elodes sp.	000	+0+	000	000	000
Elmis aenea	+0+	0+0	0+0	+0+	+00
Esolus parallelepipedus	+0+	+00	000	+0+	0+0
Limnius volckmari	+++	S++	000	+0+	+++
Oulimnius sp.	000	00+	+00	000	0+0
Oulimnius tuberculatus	+0+	S+0	S+S	000	000
Sialis lutaria	000	+00	000	000	000
Rhyacophila dorsalis	0+0	++S	+0+	+0+	++S
Glossosoma sp.	000	S+0	000	000	+S0
Agapetus sp.	000	+00	000	000	000
Wormaldia sp.	000	0+0	000	000	000
Neureclipsis bimaculata	000	000	0+0	000	000
Plectrocnemia conspersa	000	000	000	0+0	00+
Polycentropus flavomaculatus	0+S	+S+	+++	0+0	+++
Hydropsyche pellucidula	000	+00	+00	000	+0+
Hydropsyche siltalai	+0+	++S	+0+	+0+	+++
Agraylea multipunctata	000	000	0+0	0+0	0S0
Hydroptila sp.	00S	+0+	+0S	+0+	+0+
Oxyethira sp.	000	000	00S	000	000
Limnephilidae	000	+00	+00	+00	+00
Ecclisopteryx guttulata	S00	000	000	S00	000
Anabolia nervosa	000	000	S00	000	000
Potamophylax group	000	000	00S	000	000
Potamophylax latipennis	000	S00	000	000	000
Halesus radiatus	000	000	000	000	S00
Chaetopteryx villosa	000	000	000	0S0	000
Odontocerum albicorne	000	00+	000	000	000
Athripsodes sp.	000	0+0	000	000	000
Athripsodes commutatus	000	+00	000	000	000
Ceraclea sp.	000	000	0+0	000	000
Ceraclea annulicornis	000	000	00S	000	000
Lepidostoma hirtum	000	+0+	+0+	000	000
Brachycentrus subnubilus	000	+0+	000	0+0	+++
Sericostoma personatum	000	++S	+00	000	+00
Dolichopeza albipes	000	000	000	00+	000
Tipula montium group	000	00+	+0S	00+	00S
Limonia sp.	000	000	000	00+	000
Antocha vitripennis	000	0+0	000	000	000
Pedicia (Trichyphona) sp.	000	000	000	00+	000
Dicranota sp.	++S	+0+	000	+++	+++
Limnophila (Eloeophila) sp.	+++	000	000	00+	00+
Hexatoma sp.	+0+	+S0	000	+0+	+++
Pericoma fallax	000	00+	+00	000	000
Pericoma trivialis group	000	000	+00	000	000
Ceratopogonidae	0+0	00+	+0S	000	000
Chironomidae	+++	+++	+++	+++	+++
Prosimulium hirtipes	+00	000	000	+00	000
Simulium (Nevermannia) venum group	000	000	+00	0S0	+00
Simulium (Nevermannia) cryophilum group	+0+	00+	000	000	+00
Simulium (Simulium) group	000	000	000	000	+00
Simulium (Simulium) reptans group	0+0	0+0	0+0	0+0	0+0

Simulium (Simulium) argyreatum group	++0	++0	+00	++0	S00
Simulium (Simulium) argyreatum	000	S00	000	000	000
Simulium (Simulium) ornatum group	0S0	000	+00	++0	000
Empididae	000	000	000	000	0S0
Wiedemannia group	++S	S00	+00	+00	+00
Dolichopodidae	000	000	00+	000	000
Atherix ibis	000	S0+	000	000	000
Muscidae	000	000	+00	000	000
Limnophora sp.	000	000	+00	000	000

09 Laxford d/s Loch Stack NC 257447 - NC 259447 17 Apr 11 Jul 16 Oct

09

Crenobia alpina	+00
Lymnaea peregra	+++
Pisidium casertanum	0+0
Pisidium hibernicum	00+
Pisidium nitidum	++0
Oligochaeta	+++
Glossiphonia complanata	+++
Helobdella stagnalis	+00
Erpobdellidae	S00
Dina lineata	0S+
Hydracarina	+0S
Baetis scambus group	0++
Baetis rhodani	+0+
Baetis muticus	+++
Centroptilum luteolum	+00
Rhithrogena semicolorata group	+0+
Heptagenia lateralis	S0+
Ecdyonurus sp.	+++
Leptophlebia marginata	+00
Ephemerella ignita	0++
Caenis rivulorum	++S
Amphinemura sulcicollis	+0S
Leuctra inermis	+0S
Leuctra hippopus	+0S
Leuctra fusca	0+0
Perlodes microcephala	+0+
Perla bipunctata	+++
Chloroperla torrentium	+00
Chloroperla tripunctata	++0
Cordulegaster boltonii	++S
Potamonectes sp.	0+0
Oreodytes sanmarkii	00+
Limnius volckmari	+++
Oulimnius sp.	00+
Oulimnius tuberculatus	++S
Rhyacophila dorsalis	+++
Agapetus sp.	+00
Neureclipsis bimaculata	0+0
Polycentropus flavomaculatus	0++
Hydropsyche pellucidula	+++
Hydropsyche siltalai	+++
Hydroptila sp.	+++
Oxyethira sp.	+00
Limnephilidae	00+
Ecclisopteryx guttulata	00S
Athripsodes sp.	0S0
Athripsodes commutatus	S00
Mystacides sp.	S00
Mystacides azurea	0+0
Lepidostoma hirtum	+S+
Sericostoma personatum	0+0
Tipula montium group	+++

Dicranota sp.	00S
Molophilus sp.	00+
Chironomidae	+++
Simulium (Simulium) reptans group	++S
Simulium (Simulium) argyreatum group	+00
Simulium (Simulium) ornatum group	0+0
Chelifera group	00+
Wiedemannia group	++0

05	Hull	Little Driffield	TA 010576 - TA 012575	22 Apr	28 Jul	10 Oct
09	Hull	Wansford	TA 062561 - TA 064559	21 Apr	28 Jul	11 Oct
13	Hull	Corpslanding	TA 064529 - TA 066529	21 Apr	28 Jul	10 Oct
21	Kelk Beck	Harpham	TA 084614 - TA 084615	22 Apr	28 Jul	11 Oct
25	Kelk Beck	Foston	TA 092551 - TA 093545	22 Apr	27 Jul	11 Oct

	05	09	13	21	25
Spongillidae	000	000	00S	000	000
Hydridae	000	000	S00	000	000
Polycelis nigra group	+++	++0	+++	+++	++S
Polycelis felina	+++	S00	000	+++	000
Crenobia alpina	+00	000	000	000	000
Dendrocoelum lacteum	+0+	0+0	+00	000	000
Valvata cristata	000	000	+S0	000	000
Valvata piscinalis	000	00S	+00	000	+++
Potamopyrgus jenkinsi	+++	000	000	+++	+00
Bithynia tentaculata	000	000	+++	000	000
Lymnaea palustris	00S	000	000	000	0++
Lymnaea auricularia	000	000	0++	000	000
Lymnaea peregra	0+0	000	0+0	++S	000
Physa fontinalis	+++	S++	+++	+++	+++
Planorbis carinatus	000	000	00S	000	0++
Planorbis planorbis	000	0+0	000	000	000
Anisus vortex	000	S+0	+++	000	+++
Anisus leucostoma	+00	000	000	000	000
Gyraulus albus	000	+++	+++	000	000
Bathyomphalus contortus	000	000	000	00S	+0S
Acroloxus lacustris	+00	000	++S	000	000
Ancylus fluviatilis	+++	0+0	000	+++	000
Succinea sp.	000	000	000	000	0+S
Sphaerium corneum	000	+++	+++	000	0+0
Pisidium sp.	0+0	000	000	000	000
Pisidium amnicum	000	000	000	000	0+0
Pisidium milium	000	S0+	0+0	000	0++
Pisidium subtruncatum	00+	000	+00	+00	+++
Pisidium henslowanum	000	000	0+0	000	000
Pisidium nitidum	+00	+++	+++	0++	+++
Oligochaeta	+++	+++	+++	+++	+++
Piscicola geometra	S++	+00	S00	0++	00S
Theromyzon tessulatum	000	S00	+00	0S0	+00
Hemiclepsis marginata	000	000	0+0	000	000
Glossiphonia complanata	+++	+++	+++	+++	+++
Helobdella stagnalis	000	+++	+++	+00	+SS
Erpobdella testacea	000	000	+++	000	000
Erpobdella octoculata	+++	+S+	+++	+++	+++
Hydracarina	+00	+++	++S	++S	+++
Asellus aquaticus	000	+++	+++	+++	+++
Asellus meridianus	000	000	+++	+++	000
Crangonyx pseudogracilis	000	000	+++	000	+0S
Gammarus pulex	+++	+++	+00	+++	+++
Baetis scambus group	000	S+0	000	000	000
Baetis vernus	0S0	0++	0++	+++	0+S
Baetis rhodani	+++	+00	000	+++	000
Centroptilum luteolum	000	+++	+00	+S0	+++
Cloeon dipterum	000	00S	S++	000	0+0
Cloeon simile	000	000	++S	000	++S
Ephemerella ignita	++S	0+0	000	+00	S00

Caenis horaria	000	000	+0+	000	00S
Amphinemura standfussi	+00	000	000	000	000
Nemurella picteti	S00	000	000	S00	000
Ischnura elegans	000	000	000	000	00S
Velia sp.	000	000	000	0+0	0+0
Gerris lacustris	000	000	0S0	000	0++
Notonecta sp.	000	000	0+0	000	000
Callicorixa praeusta	000	000	00S	000	000
Hesperocorixa sahlbergi	000	000	000	0++	0+0
Sigara dorsalis group	000	0SS	+++	00S	0++
Sigara distincta	000	000	000	000	0S0
Sigara falleni	000	000	00+	000	0S+
Sigara lateralis	000	000	000	00+	000
Brychius elevatus	000	+++	0+0	+0+	++0
Haliphus sp.	000	0++	000	0S0	000
Haliphus lineatocollis	000	000	+0S	000	0++
Haliphus fluviatilis	000	000	0++	000	++0
Haliphus wehnckeii	000	000	S0+	000	+00
Potamonectes depressus	000	0++	S+S	000	+++
Stictotarsus duodecimpustulatus	000	0+0	0+0	000	0+0
Oreodytes sanmarkii	S00	000	S00	000	000
Hydroporus palustris	000	000	0S0	000	000
Agabus sp.	000	000	000	0+0	0+0
Agabus paludosus	000	000	000	000	+00
Platambus maculatus	000	000	0+0	000	0+0
Ilybius sp.	000	00+	000	000	000
Helophorus brevipalpis	000	0+0	0+0	0+0	0++
Helophorus grandis	000	000	000	0+0	000
Laccobius minutus	000	000	000	000	00S
Elodes sp.	000	000	000	S00	000
Elmis aenea	+++	+++	0+0	+0+	+00
Limnius volckmari	++S	000	000	000	000
Sialis lutaria	000	S++	+++	S++	+++
Rhyacophila sp.	000	+00	000	000	000
Rhyacophila dorsalis	+++	0++	000	0++	000
Agapetus sp.	+++	0+0	000	+0+	000
Polycentropus flavomaculatus	000	+S+	+0S	000	000
Cyrnus trimaculatus	000	000	00S	000	000
Lype sp.	000	000	S0S	000	000
Hydropsyche siltalai	000	+00	000	000	000
Agraylea multipunctata	000	0++	00+	000	000
Agraylea sexmaculata	000	00S	000	000	000
Hydroptila sp.	000	S00	000	+00	000
Oxyethira sp.	000	00+	000	S+0	000
Phryganea grandis group	000	000	0+0	000	000
Limnephilidae	+00	000	000	000	000
Limnephilus rhombicus	000	000	S00	000	000
Limnephilus lunatus group	+00	S+0	++0	+++	S00
Limnephilus extricatus	000	000	000	00+	000
Anabolia nervosa	000	++0	++0	000	000
Potamophylax group	00S	000	000	+00	000
Potamophylax latipennis	000	000	000	0++	000
Halesus radiatus	+00	000	S00	000	000
Melampophylax mucoreus	++0	++0	000	+++	000
Chaetopteryx villosa	0+0	000	000	0+0	000
Molanna angustata	000	000	0+0	000	000
Athripsodes aterrimus	000	000	00S	000	S0+

Athripsodes cinereus	000	+S+	+00	000	000
Mystacides sp.	000	000	+00	000	000
Goera pilosa	000	+++	000	000	000
Silo nigricornis	+++	000	000	+0+	000
Sericostoma personatum	++S	000	000	+++	+++
Tipula montium group	000	0++	000	00S	00+
Dicranota sp.	++0	++0	000	0++	000
Limnophila (Eloeophila) sp.	+S0	000	000	+00	000
Psychodidae	000	+00	000	000	000
Pericoma neglecta	+S0	000	000	000	0+0
Pericoma trivialis group	000	0+0	000	000	000
Ptychoptera paludosa	S00	000	000	000	000
Dixa nebulosa	00+	00S	000	000	00S
Ceratopogonidae	+00	+S0	000	+00	S0S
Chironomidae	+++	+++	+++	+++	+++
Simulium (Nevermannia) cryophilum group	+00	000	000	000	000
Simulium (Nevermannia) costatum	+00	000	000	000	000
Simulium (Nevermannia) angustitarse group	000	0+0	0+0	000	0S0
Simulium (Eusimulium) aureum group	000	000	000	000	00S
Simulium (Wilhelmia) sp.	000	0+0	000	000	000
Simulium (Boophthora) erythrocephalum	000	+++	0+0	000	000
Simulium (Simulium) ornatum group	0+0	+++	000	0+0	000
Empididae	000	000	00+	000	000
Chelifera group	0S0	0+0	000	+00	000
Hemerodromia group	000	000	+00	000	000
Atalanta group	000	0++	000	0+0	+00
Ephydridae	000	000	000	00S	000
Sciomyzidae	000	000	000	000	00+
Limnophora sp.	000	0+0	000	000	000

05

Crenobia alpina	+++
Oligochaeta	+++
Hydracarina	SSS
Gammarus pulex	+++
Ameletus inopinatus	+00
Baetis vernus	0+0
Baetis rhodani	+++
Baetis muticus	+++
Rhithrogena semicolorata group	+++
Ecdyonurus sp.	0++
Ephemerella ignita	0+0
Taeniopteryx nebulosa	00S
Brachyptera risi	+00
Protonemura praecox	+0+
Protonemura montana	+++
Protonemura meyeri	+0+
Amphinemura sp.	+00
Amphinemura sulcicollis	S00
Nemoura cambrica group	+00
Leuctra inermis	+++
Leuctra fusca	0+0
Diura bicaudata	+S+
Isoperla grammatica	++0
Oreodytes sanmarkii	0+0
Hydraena gracilis	SS0
Helophorus aequalis	0+0
Helophorus brevipalpis	0+0
Elodes sp.	00+
Elmis aenea	+++
Limnius volckmari	0++
Oulimnius tuberculatus	00+
Rhyacophila dorsalis	+++
Rhyacophila oblitterata	0S+
Glossosoma sp.	S00
Philopotamus montanus	S0+
Plectrocnemia conspersa	0+0
Drusus annulatus	+++
Potamophylax group	00S
Potamophylax cingulatus	+00
Melampophylax mucoreus	+S0
Chaetopteryx villosa	0+0
Beraea maurus	00+
Dicranota sp.	+++
Pericoma neglecta	++S
Dixa puberula	0+0
Chironomidae	++S
Simulium (Nevermannia) cryophilum group	+++
Simulium (Simulium) argyreatum group	+++
Wiedemannia group	+++

5.3 Preliminary comments on the fauna

In this section of the report we offer a brief commentary on the invertebrate fauna of the rivers sampled in 1989. A full appraisal of the fauna at all sites sampled within the contract will be given in the final year of the project. The purpose here is to highlight rivers which support rich species assemblages in particular taxonomic groups and to draw attention to the occurrence of some rare or notable species.

In Table 2 the number of different taxa recorded within each major taxonomic group is given for each river sampled. The data have been abstracted from the species x sites matrices in section 5.2 and only include demonstrably different taxa. That is, in cases where a list includes identifications at two taxonomic levels (e.g. *Silo* sp. and *Silo pallipes*) only one taxon is counted.

In view of the fact that the number of sites examined on each river or stream varied between one and five, caution is required in the interpretation of the results. Nevertheless, a number of features are clearly apparent.

Between them, the two Malham-Arncliffe streams with their different features, have a diverse assemblage of Ephemeroptera, Plecoptera and Trichoptera. Although they are both upland limestone streams, Cowside Beck, the larger of the two, is generally faster flowing. In contrast, Gordale Beck, after rising as a large spring pool, has a more modest flow before plunging down a waterfall section (Ratcliffe, 1977).

The Brora/Blackwater system in Sutherland also supports a variety of Ephemeroptera, Plecoptera and Trichoptera, but there is only limited representation of non-insect taxa and no Crustacea were recorded during this survey. Similar comments are relevant to the R. Laxford, a naturally regulated base-poor river in the north-west of Sutherland, where just one site was examined downstream of Loch Stack.

The R. Hull, a northern chalk stream and its tributary, the Kelk Beck, have a wide range of non-insect taxa and in particular the variety of Gastropoda and Hirudinea are worthy of comment. Of the insect orders, both the Coleoptera and Trichoptera are well represented but the range of Ephemeroptera and Plecoptera is disappointingly low. This paucity of mayflies and stoneflies was first

Table 2. Number of different taxa recorded in each major taxonomic group for the running water sites sampled in 1989. Information relating to Cowside Beck and Gordale Beck is presented separately, but also combined since they form part of the Malham-Arncliffe complex in the NCR (Ratcliffe, 1977).

No. sites sampled	Cowside Beck 2	Gordale Beck 2	Cowside + Gordale (4)	Brora + Blackwater 5	Laxford 1	Hull + Kelk Beck 5	Knock Ore Gill 1
Spongillidae	-	-	(-)	-	-	1	-
Hydridae	-	1	(1)	-	-	1	-
Tricladida	2	2	(2)	2	1	4	1
Gastropoda	5	4	(6)	5	1	17	-
Bivalvia	1	3	(3)	3	3	6	-
Oligochaeta	+	+	(+)	+	+	+	+
Hirudinea	-	1	(1)	2	3	7	-
Hydracarina	+	+	(+)	+	+	+	+
Crustacea	1	1	(1)	-	-	4	1
Ephemeroptera	14	16	(20)	17	10	8	7
Plecoptera	16	11	(16)	16	8	2	11
Odonata	-	-	(-)	-	1	1	-
Hemiptera	-	2	(2)	2	-	9	-
Coleoptera	12	14	(16)	9	4	17	8
Megaloptera	-	-	(-)	1	-	1	-
Trichoptera	22	17	(28)	23	13	26	10
Diptera	20	19	(26)	23	9	22	7

noted by Whitehead (1935) and later confirmed by Pearson & Jones (1984). The latter compared their results with those of Langford & Bray (1969) who surveyed a number of nearby Lincolnshire streams. The R. Hull does appear to be species poor in these two groups compared to relatively similar streams in Lincolnshire and Pearson & Jones (1984) speculate on possible reasons for these findings.

Knock Ore Gill, a precipitous limestone stream flowing westwards off the Pennines, resembles Cowside Beck in some features, but has its origin at a higher altitude. Our single site was at 590 m and, as anticipated, had a poor range of non-insect taxa (no Gastropoda, Bivalvia or Hirudinea recorded). In view of the location of the site the Ephemeroptera, Plecoptera and Trichoptera were well represented, but a wider range of both non-insect and insect taxa would be expected further downstream.

There follows a brief commentary on the macroinvertebrate fauna of each river, with emphasis on the occurrence of rare or notable taxa. One source for evaluating the status of taxa is Report No. 66 of the NCC Chief Scientist Directorate, compiled by Ball (1986), which lists some groups of freshwater invertebrates with Red Data Book (RDB) or Nationally Notable (N) status. The relevant codes for this report are:-

Na: less than 30 known occurrences in 10 km squares of the national grid

Nb: less than 100 known occurrences in 10 km squares of the national grid

Refer to Ball (1986) for further details.

Clearly, the designated status of a species may change over time in the light of new information on distribution or as a result of environmental changes which may have either beneficial or adverse effects on distribution and abundance.

The IFE data-base, used in the latest classification and prediction system, currently holds information on 438 sites from almost 80 river systems throughout Great Britain. It will be a valuable additional source of information on rare and infrequent taxa at the study sites when a full evaluation is undertaken at the end of the contract. In this report, information from the IFE data-base is used for further assessment of a small number of taxa, some of which are not considered in Ball (1986).

Malham-Arncliffe Streams

a) Cowside Beck

Rich assemblages of Ephemeroptera, Plecoptera and Trichoptera. In particular, the Trichoptera include some species which are rather local in their occurrence and/or characteristic of upland conditions (e.g. *Tinodes dives*, *Metalype fragilis* and *Allogamus auricollis*.)

Coleoptera: *Helophorus arvernicus* (Nb)

[Recorded at just 2 (0.5%) of the 438 IFE sites.]

Riolus cupreus (Nb)

Riolus subviolaceus (Nb)

[*R. cupreus* recorded at 14 (3.2%) and

R. subviolaceus at 36 (8.2%) of the 438 IFE sites.]

b) Gordale Beck

Rich assemblages of Ephemeroptera, Plecoptera and Trichoptera, the latter including *Tinodes dives* and *Metalype fragilis*.

Ephemeroptera *Caenis pusilla*

First recorded in Britain by Malzacher (1986), from the R. Wye and the R. Frome (Dorset) and later by T. Gledhill from the Candover Brook, a tributary of the R. Itchen (in Elliott, Humpesch & Macan, 1988). We have further unpublished records for the Yorkshire Derwent in 1988 as a result of samples taken for the NCC under a separate contract.

Coleoptera: *Riolus cupreus* (Nb)

Riolus subviolaceus (Nb)

R. Brora/Blackwater

No rare species, but the occurrence of the plecopteran *Brachyptera putata* at three sites may be worth highlighting since it is apparently confined to Britain. Note however that Hynes (1984) indicates that it is fairly closely related to *B. monilicornis* (Pict.). *Brachyptera putata* has been recorded at 10 (2.3%) of the 438 IFE sites.

R. Laxford

No rare species.

R. Hull/Kelk Beck

No rare species, but two apparently local species were found. The first is the trichopteran *Agraylea sexmaculata* which has been recorded at one (0.2%) of the 438 IFE sites. Barnard (1971) first described larvae of this hydroptilid, based on British material, and at that time records were confined to southern chalk streams, one or two standing waters in the south and east, together with a further record in the Malham Tarn area. Another local species is the blackfly, *Simulium costatum*, which is largely confined to spring-fed streams and trickles (Davies, 1968). It has been noted at 6 (1.4%) of the 438 IFE sites.

Knock Ore Gill

No nationally rare species, but two scarce plecopterans which are characteristic of high altitude streams were recorded. They are *Protonemura montana* (no confirmed records in the IFE 438 site data-set) and *Diura bicaudata* (3 records only - 0.7%).

5.4 BMWP scores (SCR), number of scoring taxa (TX) and Average Score per Taxon (ASPT) at each site for single seasons and for 3 seasons data combined. All values are based on the total number of BMWP families recorded in the main plus supplementary samples.

		Spring			Summer			Autumn			Combined		
		SCR	TX	ASPT	SCR	TX	ASPT	SCR	TX	ASPT	SCR	TX	ASPT
Cowside Beck	Nab End	129	20	6.45	115	19	6.05	157	24	6.54	175	27	6.48
	Arncliffe	128	20	6.40	120	20	6.00	180	27	6.67	195	29	6.72
Gordale Beck	Seaty Hill	163	24	6.79	131	22	5.95	184	29	6.34	201	31	6.48
	Gordale Bridge	134	21	6.38	126	21	6.00	154	24	6.42	188	28	6.71
R.Brora	Dalnessie	116	17	6.82	98	16	6.13	78	13	6.00	169	25	6.76
	U/S Balnacoil	208	31	6.71	144	21	6.86	163	24	6.79	247	36	6.86
	D/S Loch Brora	155	25	6.20	116	20	5.80	97	17	5.71	185	29	6.38
R.Blackwater	Creag Dhubh	134	20	6.70	94	15	6.27	80	12	6.67	166	24	6.92
	Pollie	159	24	6.63	118	19	6.21	125	19	6.58	195	28	6.96
R.Laxford	D/S Loch Stack	159	25	6.36	159	25	6.36	153	25	6.12	198	30	6.60
R.Hull	Little Driffield	122	24	5.08	105	21	5.00	100	20	5.00	125	25	5.00
	Wansford	116	24	4.83	143	28	5.11	108	23	4.70	155	31	5.00
	Corpslanding	115	25	4.60	127	28	4.54	105	23	4.57	169	34	4.97
Kelk Beck	Harpham	126	25	5.04	123	26	4.73	110	24	4.58	153	31	4.94
	Foston	98	21	4.67	89	22	4.05	118	26	4.54	143	30	4.77
Knock Ore Gill	Green Castle	117	18	6.50	111	18	6.17	117	18	6.50	154	23	6.70

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